STANDARDS CHANGES CATALOG (SCC)

SCC NUMBER: SCC #136

CHANGE PROPOSAL TITLE: Robust PDU ~~c~~Construction ~~c~~Clarification, Appendix J section J.4.

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AFFECTED DOCUMENT: ~~Appendix J, rev C of~~ MIL~~il~~-STD~~td~~-188-220C, Appendix B and J section J.4

PRECEDENCE: Routine

RECOMMENDATIONS:

RECORD OF PROCESSING

DATE:	ACTION:
13 Nov 02	Proposal / R0
15 Jan 03	Work Item
5 Mar 03	R1
2 June 03	R2
20 October	R3; Approved for MIL-STD-188-220C

1. STATEMENT OF THE PROBLEM:
The Robust PDU construction described in Appendix J paragraphs J.4, J.4.1, J.4.2 and J.4.3 is not described correctly.

2. PROBLEM ANALYSIS:
The Robust PDU transmission construction order and the sequence of processing order of a Robust PDU are not correct.

3. PROPOSED SOLUTION:

a. Change the paragraphs J.4, J.4.1, J.4.2, J.4.3, and J.4.4 to read:

J.4 PDU construction. The following examples shall be used to clarify robust PDU transmission order and processing order (i.e. scrambling~~, FEC,~~ convolutional coding and formation of packets). ~~The input to the robust protocol is a 188-220 DL PDU. The DL PDU is user data to the N-1 layer (i.e. robust protocol).~~ The robust protocol consists of three parts: (1) robust PDU header – robust frame synchronization and setting of the robust frame format, (2) the PL scrambled or unscrambled and/or convolutional coded user data and (3) SOPs and segment counters to form packets in accordance with the setting of the multi-dwell transmission format when the multi-dwell protocol is implemented. In this example, the MSB (2^n bit) of each octet of user data and the MSB of each ~~control~~ field is represented with an italicized font. The figure XX shows the processing order with convolutional code disabled, no multi-dwell hope detection and no link outage.

J.4.1 Robust PDU header. The robust PDU header ~~protocol~~ consists of ~~three~~ two parts: (1) robust frame synchronization pattern (see Figure 7) and (2) setting of the robust frame format (RFF) (see Tables I, II and III). ~~and setting of the robust frame format, (2) scrambling and/or FEC of the user data according to the robust frame format, and (3) inserting of SOPs and segment counters to form packets when the multi-dwell flag is set (the multi-dwell flag is part of the robust frame format field). When the robust frame format selects both scrambling and FEC encoding, the user data is scrambled before the user data is FEC encoded. The scrambling and FEC encoding is only applied to the user data.~~ The robust PDU header shall be inserted first when implementing Robust Communications Protocol. The robust frame format shall be formatted with multi-dwell majority vote 3 out of 5 BCH [15, 7] coding. The examples show the differences based on the multi-dwell flag settings to append the rest of the data.

J.4.2 User data. The input to the robust protocol is a 188-220 DL PDU. The DL PDU is user data to the N-1 layer (i.e. robust protocol).

PL scrambling and convolutional coding shall be applied to the user data if selected in the robust frame format. ~~In this example, t~~When the robust frame format selects both scrambling and convolutional coding, the user data is scrambled before the user data is convolutional coded. The LSB of each octet passed from the data shall be transmitted first. However, in the following examples, PL scrambling and convolutional coding ~~is~~are not selected, the user data is not a real DL PDU which reduces coupling between changes in the 188-220 frame and this example. The example user data is an array of octets counting down 49 – 0.

J.4.3 Multi-dwell flag set. ~~The multi-dwell protocol (MDP) is the main role of the robust communications protocol. The multi-dwell flag shall be set in the robust frame format if MDP is implemented. When the multi-dwell flag is set, the robust frame synchronization field and robust frame format shall be inserted. Scrambling and/or FEC shall be applied to the user data if selected in the robust frame format. The user data shall be put into packets by inserting SOPs and segment counters (BCH [15,7] shall be applied to the segment counters according to the selected multidwell transmission format). Either PL scrambled or unscrambled user data shall be broken into 64-bit segments and packets then by inserting SOPs and segment counters except the first packet. BCH [15,7] shall be applied to the segment counters according to the selected multi-dwell transmission format in the RFF. 32-bit or 64-bit SOP pattern, # of BCH [15,7] copy, and # of segments per packet are strictly according to the setting of the multi-dwell transmission format in the RFF. An example of the robust transmission via multi-dwell transmission format 3 (MV 3:5, 6 segments), no PL scrambling, no FEC encoding, and without a hop occurring is in Table LXXVIII.~~The multi-dwell protocol (MDP) is the main component of the Robust Communication Protocol (RCP). The multi-dwell flag shall be set in the robust frame format (RFF) if MDP is implemented. Either PL scrambled or unscrambled, and/or convolutional coded user data shall be divided into 64-bit segments. Based on the Multi-dwell Transmission Format (MDTF) setting, these segments shall be packed into 6, 11, or 13 segment groups. Then, a packet shall be formed by appending the SOP and the segment counter to the end of the group. BCH [15,7] shall be applied to the segment counter prior to appending. The number of BCH [15, 7] copies, 32-bit or 64-bit SOP pattern, and the number of segments per packet are determined by the MDTF setting. An example of the robust transmission with MDTF=3 (64-bit SOP, MV 3:5, 6 segments), no PL scrambling, no convolutional coding and without a hop occurring is shown in Table LXXVIII.

J.4.4 Multi-dwell flag not set. When the multi-dwell flag is zero the data shall not be put into packets. Only the robust frame synchronization field and robust frame format shall be inserted and ~~scrambling and/or FEC shall~~

~~be applied to the user data (see Table LXXIX).~~ PL scrambling, and/or convolutional coding can be applied to the user data. An example of the robust transmission without MDP, no PL scrambling, no convolutional coding is shown in Table LXXIX.

b. Change Appendix B as shown below.

410.1.6	Application Guidance for the HAVEQUICK II Link	J.3.6	102.1.3.4:M	Yes__ No__	
410.1.6.1	Frequency Hop Synchronization	J.3.6.1	102.1.3.4:M	Yes__ No__	
410.1.6.1.a	To avoid the loss of critical data, such as the cryptographic synchronization and/or the protocol SOM patterns, the DTE transmission timing shall be synchronized to the frequency hops through use of hop detection and prediction	J.3.6.1	102.1.3.4:M	Yes__ No__	
410.1.7	Summary	J.3.7	102.1.3.4:M	Yes__ No__	
410.1.7.a	To maintain network timing using the Type 1 timing equations, the RHD shall be extended by inflating the S time for a fixed Type 1 acknowledgment transmit frame format for multi-dwell operation assuming the worst case hop rate (Hop All)	J.3.7	102.1.3.4:M	Yes__ No__	
410.1.7.b	Since the message transmission time is variable, the time-out period (TP) sync point shall be figured from the final frame flag at the end of the transmission	J.3.7	102.1.3.4:M	Yes__ No__	
410.2	PDU Construction	J.4	102.1.3.4:M	Yes__ No__	
410.2.a	The following examples shall be used to clarify robust PDU transmission order and processing order (i.e. scrambling~~, FEC,~~ convolutional coding, and formation of packets)	J.4	102.1.3.4:M	Yes__ No__	
410.2.1	Robust PDU Header	J.4.1	102.1.3.4:M	Yes__ No__	
410.2.1.a	The robust PDU header shall be inserted first when implementing Robust Communications Protocol	J.4.1	102.1.3.4:M	Yes No	
410.2.1.b	The robust frame format shall be formatted with multi-dwell majority vote 3 out of 5 BCH [15, 7] coding	J.4.1	102.1.3.4:M	Yes No	
410.2.2	User Data	J.4.2	102.1.3.4:M	Yes__ No__	
410.2.2.a	PL scrambling and convolutional coding shall be applied to the user data if selected in the robust frame format	J.4.2	102.1.3.4:M	Yes No	
410.2.2.b~~a~~	The LSB of each octet passed from the data shall be transmitted first	J.4.2	102.1.3.4:M	Yes__ No__	
410.2.3	Multi-Dwell Flag Set	J.4.3	102.1.3.4:M	Yes__ No__	
410.2.3.a	~~When t~~The multi-dwell flag ~~is~~shall be set~~,~~ in the ~~r~~robust ~~f~~frame ~~synchronization field and robust frame f~~format (RFF)~~shall be inserted~~ if MDP is implemented	J.4.3	102.1.3.4:M	Yes__ No__	

410.2.3.b	~~Scrambling and/or FEC shall be applied to the user data if selected in the robust frame format~~ Either PL scrambled or unscrambled, and/or convolutional coded user data shall be broken into 64-bit segments. Based on the Multi-dwell Transmission Format (MDTF) setting, these segments shall be packed into 6, 11, or 13 segment groups. Then, a packet shall be formed by appending the SOP and the segment counter to the end of the group	J.4.3	102.1.3.4:M	Yes__ No__	
410.2.3.c	~~The user data shall be put into packets by inserting SOPs and segment counters (~~BCH [15,7] shall be applied to the segment counter~~s~~ prior to appending. The number of BCH [15, 7] copies, 32-bit or 64-bit SOP pattern, and the number of segments per packet are determined by the MDTF setting~~according to the selected multi-dwell transmission format)~~	J.4.3	102.1.3.4:M	Yes__ No__	
410.2.4	Multi-Dwell Flag Not Set	J.4.4	102.1.3.4:M	Yes__ No__	
410.2.4.a	When the multi-dwell flag is zero the data shall not be put into packets	J.4.4	102.1.3.4:M	Yes__ No__	
410.2.4.b	Only the robust frame synchronization field and robust frame format shall be inserted and PL scrambling~~, and/or FEC~~and/or convolutional coding ~~shall~~ can be applied to the user data	J.4.4	102.1.3.4:M	Yes__ No__	

A.7.10 Bose-Chaudhuri-Hocquenghem (15, 7) Coding Algorithm

Item	Protocol Feature	Reference	Status	Support	Notes
411	Bose-Chaudhuri-Hocquenghem (15, 7) Coding Algorithm	Appendix K	102.1.3.4:M	Yes__ No__	
411.1	BCH (15, 7) Code	K.3	102.1.3.4:M	Yes__ No__	
411.1.1	Hardware Encoding	K.3.1	102.1.3.4:O.<2>	Yes__ No__	
411.1.2	Hardware/Software Decoding	K.3.2	411.1.1:M 411.1.3:M	Yes__ No__ Yes__ No__	
411.1.3	Software Encoding	K.3.3	102.1.3.4:O.<2>	Yes__ No__	

c. Add these figures at the end of Appendix J.

The main figure is shown as Figure XX. For clarity purpose Figure XX is broken in two parts at the dotted line and shown as Figures XXa and Figure XXb. The connection points are shown as A, B, C and D in figures XXa and XXb at the broken section in figure XX.

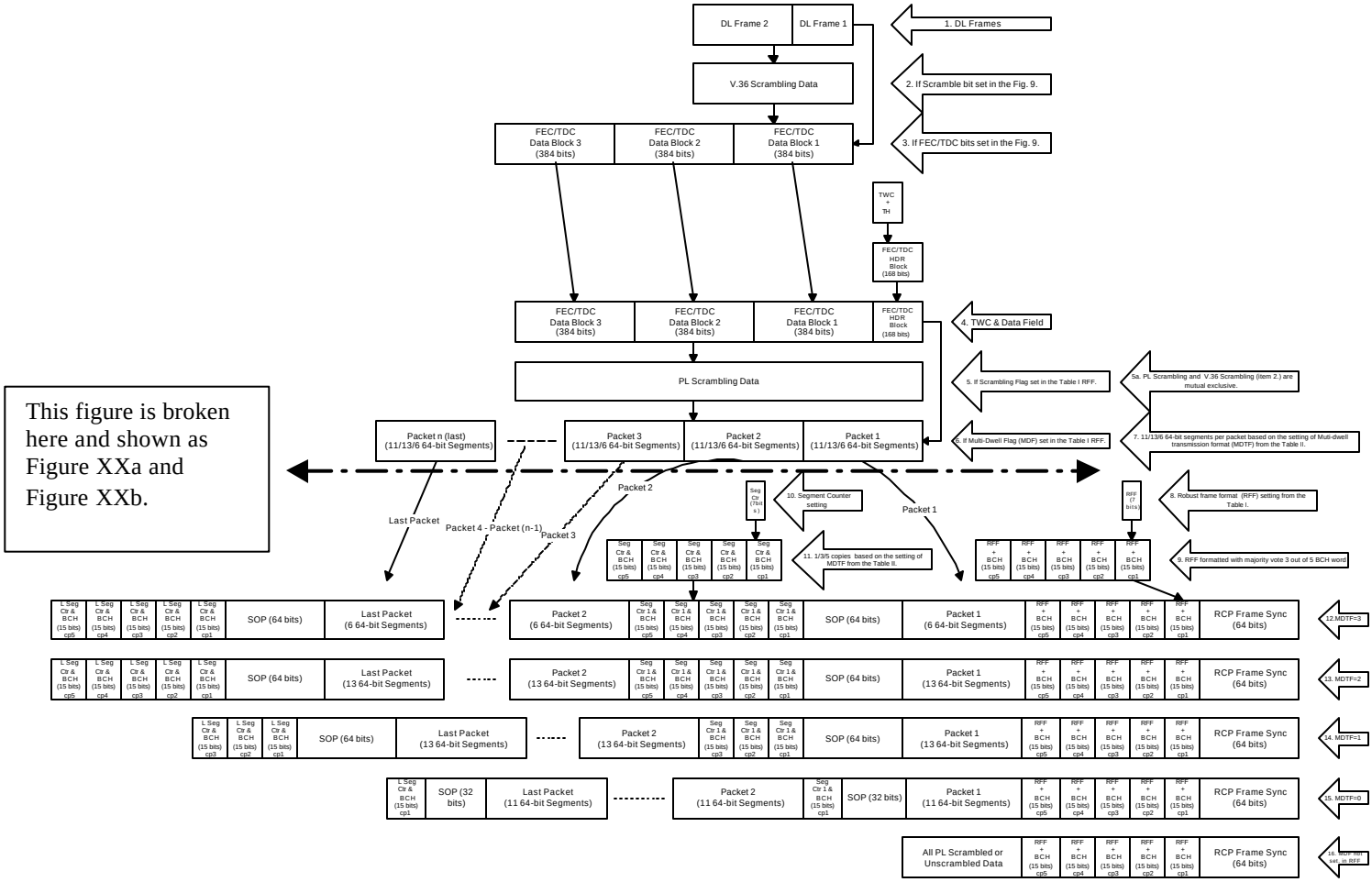

Figure XX. Robust PDU construction

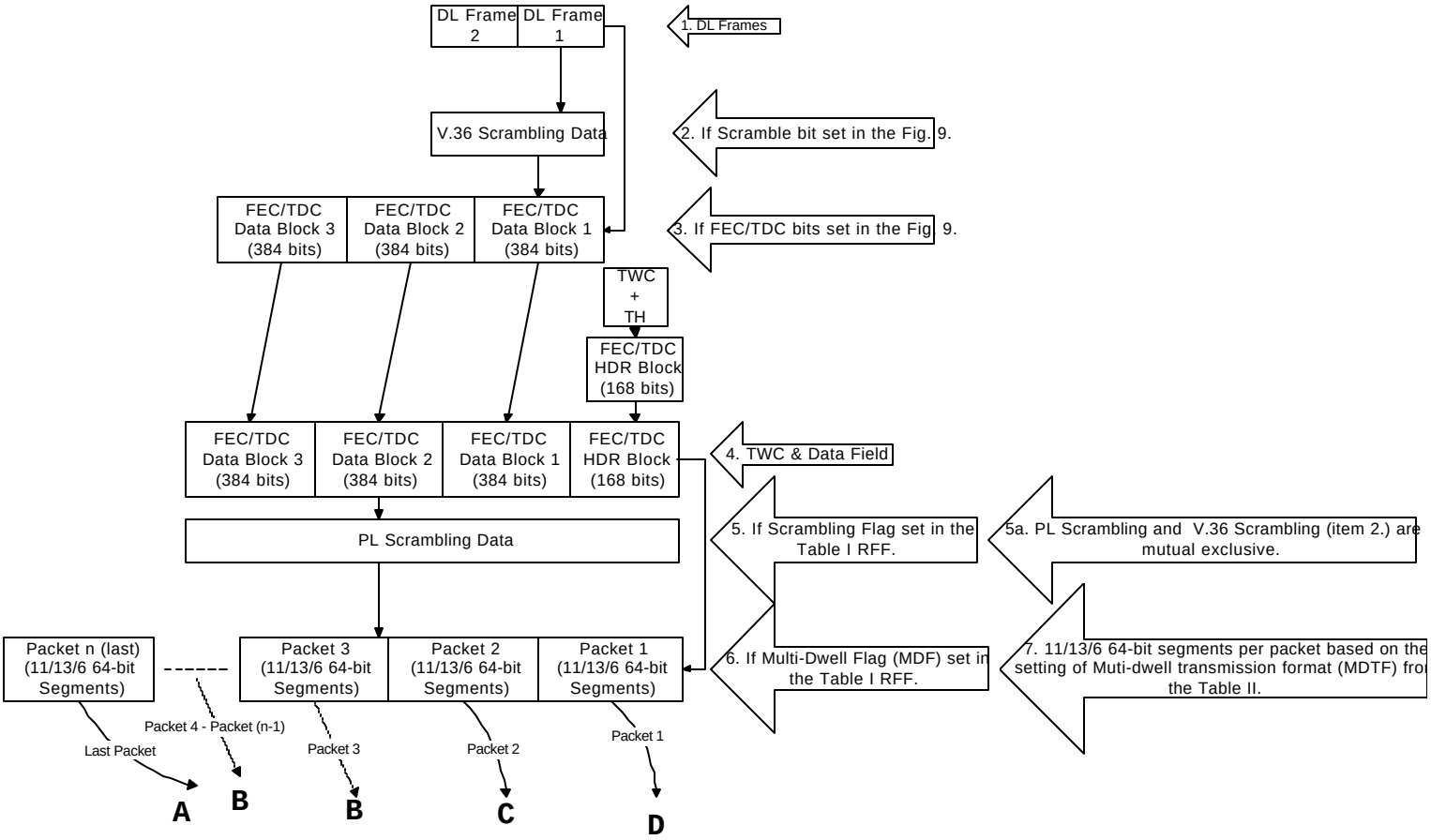

Figure XXa. Robust PDU Construction (Top Part)

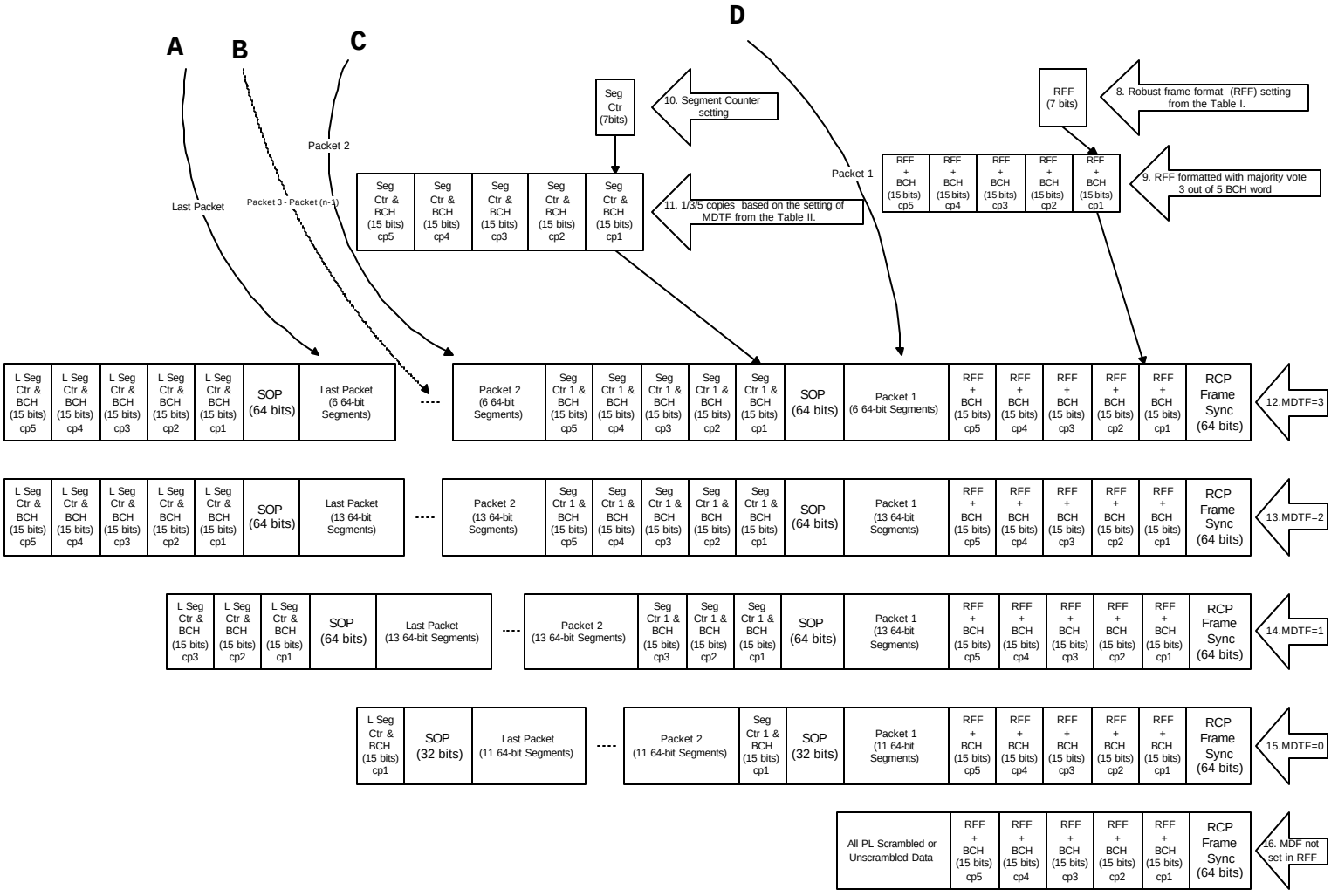

Figure XXb. Robust PDU Construction (Bottom Part)

4. ALTERNATIVE SOLUTIONS: None.

5. SYSTEM CHANGES REQUIRED: None.

6. CONFIGURATION ITEM DOCUMENTATION CHANGES:
MIL~~il~~-STD~~td~~-188-220C, Appendix J, paragraph J.4, J.4.1, J.4.2, J.4.3, and J.4.4.

7. IMPACT ON INTEROPERABILITY: None.

8. IMPACT ON RELATED DOCUMENTS: None.

9. IMPLEMENTATION DATES: TBD

10. OTHER CONSIDERATIONS: ~~None.~~This SCC is associated with SCC #134 and SCC #135.

11. REFERENCES: None.

12. Trouble Reports (TRs) ADDRESSED IN THIS SCC: None.